Moving toward active transportation: how policies can encourage walking and bicycling

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RESEARCH REVIEW

Moving Toward Active Transportation: How Policies Can Encourage Walking and Bicycling

INTRODUCTION

Walking and cycling for daily trips can provide valuable regular physical activity, but currently, few Americans walk or ride a bicycle as a part of their daily routine. Most rely on their automobiles to go to work, shop for groceries, or just get around. As a result, "active travel," such as walking or biking for routine trips, is not a significant part of daily life for most Americans, providing little, if any, regular physical activity.

Lack of physical activity is a major risk factor in over 5 million, or 9 percent, of premature deaths worldwide.[1] In economic terms, the burden from lack of physical activity is estimated to be $117 billion dollars or 9–11 percent of total health care costs in the U.S.[2]

According to the latest U.S. household travel survey data, only 11 percent of all trips are taken by foot, 1 percent by bicycle, and 2 percent by public transport (which usually also involves either walking or riding a bicycle to and from a train station or a bus stop).[3] Higher rates of active travel are found in Western European countries such as Germany, the U.K., and the Netherlands (Figure 1).[4,5] Active travel can be a big help in reaching recommended daily levels of physical activity of at least 30 minutes on most days, or 150 minutes per week.[4,6]

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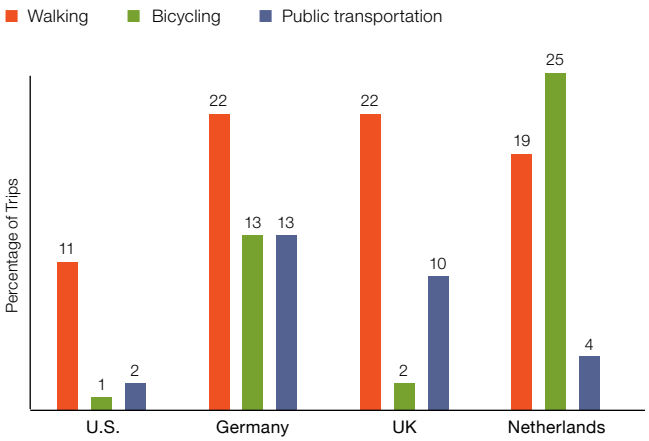
FIGURE 1 **Rates of Active Travel in America Are Lower Than in Western European Countries**[4,5]



Driving is a major source of physical inactivity and is associated with overweight and obesity. In a review of 10 studies, 8 provided evidence suggesting that higher levels of driving (either as time or distance in a motor vehicle) are associated with a higher risk of increased weight.[7]

One reason why so many people drive in the U.S. is decades of car-centric planning, which has led to a system that makes driving convenient and cheap, but poses many obstacles to walking, cycling, and transit use. Examples of car-centric planning include:

- Transportation decisions have mostly been based on measurements of the delays that cars experience on existing roads, a practice that can lead to the building of large roads that only accommodate cars.[8]
- A minimum supply of car parking mandated for most new buildings, such as private homes, businesses, shops, or restaurants. As a result, for most trips in the U.S., car parking is free, and there is often an ample supply of it.[9]
- The federal government allows a deduction of up to $250 for car parking, compared to a $130 deduction for purchasing transit/commuter tickets.[10]
- Gasoline and vehicle taxes pay only about 60–70 percent of roadway building and maintenance expenditures by all levels of government. The rest is paid for by non-transport related taxes, such as property, sales, or income taxes.[11]

At the same time, obstacles to walking, bicycling, or use of public transport include:

- Lack of sidewalks, crosswalks, and bikeways;
- Lack of connectivity of pedestrian or bike infrastructure;
- Actual and perceived dangers of walking and cycling; and
- Poor supply of public transport.

Active travel can be a significant source of regular physical activity when built into daily routines, and in most cases, it requires few skills, little extra time, and is inexpensive. Most daily trips are within easy walking or biking distance (Figure 2).

This research review summarizes evidence on the health benefits and safety of active travel, and examines policies and programs that can help increase active travel.

METHODOLOGY

The amount of research on both determinants of active travel and the links between active travel and public health has increased sharply over the last decade. This research review updates the Active Living Research (ALR) brief on the same topic from 2009.[12] To assess the state of knowledge in this vast and dynamic field, we examined peer-reviewed scholarly review articles published between 2009 and 2015, using search terms and combinations of search terms such as: active transport, active travel, bicycle, bicycling, bike, bike lane, bike share, built environment, connectivity, cycling, e-bike, education, enforcement, gasoline, GPS, infrastructure, land use, open streets, parking, pedestrians, public transit, safety, sidewalk, speed limits, topography, traffic, traffic calming, walking, network connectivity, traffic, traffic calming, walking, public transit, and public transport.

The databases searched were Web of Science, TRID, PubMed, and Health Evidence. The identified review articles were supplemented with select key original studies and reports.

KEY FINDINGS

The health benefits of physical activity in general have been well-documented by hundreds of studies.[13] More recently, a growing number of studies have confirmed that these benefits are linked to walking and cycling specifically.[14–16]

- Physical activity has been associated with a risk reduction for premature death and a number of chronic diseases. Estimated risk reductions between the most active and the least active groups are substantial, i.e., about 30 percent for all causes of death; 20–35 percent for cardiovascular disease, coronary heart disease and stroke; 30–40 percent for type 2 diabetes; about 30 percent for colon cancer; and about 20 percent for breast cancer.[13]

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- A growing evidence base, specifically on cycling or walking, confirms the health benefits already observed in studies on general physical activity.[14-16]
- For people who cycle or walk for any purpose at a level corresponding to World Health Organization (WHO) recommendations for physical activity (i.e., 150 minutes/week), the risk of mortality for all causes is reduced by about 10 percent.[14,17]
- Two separate reviews found that the risk of cardiovascular diseases is reduced by 16 percent for people who walk 3 hours per week[18] and by 11 percent for people who actively commute (compared to people who do not actively commute).[19]

The health benefits of active transportation exceed its risks of injury and exposure to air pollution.

- Reviews of 30 health impact modeling studies, which quantify benefits from walking or cycling due to increases in physical activity, as well as resulting risks from exposure to air pollution or crashes, have consistently demonstrated that health benefits from active travel outweigh risks.[20–22]
- A study in the San Francisco Bay Area assessing the health impacts from shifting short car trips to walking and cycling found that 1,501 premature deaths would be avoided annually due to increases in physical activity, while 61 pedestrians or cyclists would be at risk of dying each year from crashes.[23]
- The risk associated with traffic crashes and the level of exposure to air pollution can vary greatly by location,[24,25] impeding walking or cycling on high-traffic roads.
- Cycling can result in greater exposure to air pollution because air pollution concentrations are typically increased along roads, and elevated breathing rates from the effort of cycling can lead to higher intake of pollutants.[26,27] However, there are no studies available that link exposure to air pollution from cycling directly to long-term health effects.[28]

Safety is a key consideration for promoting active travel. Importantly, places with higher levels of walking and cycling also have greater safety for pedestrians.

Safety concerns, both real and perceived, are a major deterrent to active travel. Crashes and injuries have severe consequences, and there is a growing body of evidence on safer infrastructure design. Yet, for widespread acceptance of active transportation, low crash risks are not sufficient—active travel needs to feel safe as well.

- Fatality risks in the U.S. are much greater for all modes of travel than in most Western European countries, whether measured per capita or per mile traveled, and both on and off motorways.[29] For example, the cycling fatality rate in the U.S. is five times higher than in the Netherlands or Denmark, indicating that there is room for improvement. Nonetheless, with approximately 5.5 cyclists killed per 100 million km cycled, deadly crashes are rare even in the U.S.[30,31]
- The principle of "safety in numbers" has been observed widely. Studies have shown that bicycling safety is greater in countries and cities with higher levels of bicycling, and that bicycling injury rates fall as levels of bicycling increase. The same is true for walking. Safety and promotion of active travel therefore go hand in hand.[32–34]
- The underlying reasons for "safety in numbers" are not clear.[35] One rationale is that drivers have increased awareness in areas where cyclists and pedestrians are commonly seen. However, while it could be that a higher number of walkers and cyclists improve safety in this way ("safety in numbers"), it could also be that safety improvements to infrastructure increases the numbers of walkers and cyclists ("numbers in safety").[28]
- Both more cycling and greater safety are typically observed in environments with better and more infrastructure and more pro-walk/bike policies and programs.[35]

Provision of convenient, safe, and connected walking and cycling infrastructure is at the core of promoting active travel.

Physically separating cyclists and pedestrians from cars, where motorized traffic volumes and speeds are high, is important. So is reducing vehicle speeds and traffic volume through traffic calming on other streets.

- Cyclists seem to favor streets with little and slow motorized traffic as well as separate paths and/or lanes over cycling on roadways with high volumes of fast-moving motorized traffic.[36]
- For pedestrians, the presence of sidewalks, crosswalks, and paths can reduce crash risk and increase convenience and comfort.[37]
- Areas with more amenities for biking and walking, such as sidewalks, bicycle lanes, or paths are associated with more active commuting to school.[38]
- Shorter distances between home and a bike route, provisions of separate paths and cycle tracks, and separation from traffic are all related to increases in cycling.[39]

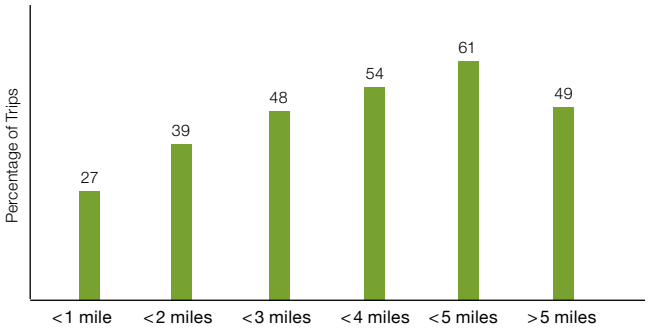
- Several studies indicate that the fear of cycling on roads with motorized traffic is greater among inexperienced cyclists, risk-averse individuals, women, and younger cyclists.[36] Bike paths and separate facilities are perceived as safer which may help less confident cyclists make the decision to ride a bicycle.[37]
- Bike parking and shower and locker facilities at work are associated with more bike commuting. Free car parking at work is associated with less bike commuting.[40]
- Sidewalks, crosswalks, and paths, can reduce walking crash risk, and increase walking. By increasing active transport, these features tend to reduce total crash rates owing to the "safety in numbers" effect.[41]
- Area-wide urban traffic calming efforts have been shown on average to reduce the number of crashes with injuries by about 25 percent on residential streets, and 10 percent on main roads.[42]
- Less car travel per capita, slower car travel speeds, narrow lanes, and traffic calming in dense urban areas help increase traffic safety.[43]
- Besides the health benefits that active travel promises, studies suggest that such efforts are cost-effective,[44] even without considering the various additional benefits (i.e., reduced traffic congestion and pollution) associated with increases in active travel.[45]

Aside from specific infrastructure for cyclists and pedestrians, the way neighborhoods and communities are built affects levels of active travel.

The so-called "Five Ds" of the built environment—**D**ensity, **D**iversity, **D**esign, **D**estination, and **D**istance to transit—have been found to reduce car use and promote walking, cycling, and public transportation usage. Effects of individual measures relating to the "Five Ds" are small, but the joint effect of multiple measures may be large.[46] Density of people, housing, workplaces and/or intersections results in reduced travel distances, which favors walking and cycling.

- Traffic volume, highway density, and traffic speeds are negatively associated with levels of active travel, while smaller block size, access to public transport, retail, neighborhood shops, and street connectivity are positively associated with levels of bicycle ridership.[47]
- Shorter blocks and more opportunities to cross roadways are associated with more walking.[46]
- The available evidence consistently suggests that there is a positive relationship between bikeway networks and cycling levels.[36] Bikeway networks typically consist of bike paths, bike lanes, and local streets with low speeds and volumes of motorized traffic.
- Street connectivity is associated with more active travel to school.[38] Streets with higher connectivity have smaller, shorter blocks, and offer shorter or more pleasant routes.
- Walking and cycling can be increased by community-scale urban design and land use policies. These include zoning regulations and building codes, that encourage transit-oriented development, higher street connectivity, higher density of development, and having more stores, jobs and schools within walking distance of where people live.[48]

FIGURE 2 **Most Daily Trips in U.S. Are Within Easy Walking or Biking Distance**[3]



Walking or biking for daily travel needs can be promoted as a convenient and competitive option through programs that shift travel behavior.

- Some behavior-change programs that targeted information or advice to groups already motivated to walk or bike were found to be effective in shifting as much as a 5 percent of all household trips from cars to walking or cycling.[49]
- Programs that were tailored to individuals or small groups who were already motivated to change their behavior resulted in increased walking overall by 30–60 minutes per week, and walking for transportation by 15–30 minutes per week in the short term.[50]
- However, there is currently insufficient evidence that by themselves, programs targeting the general population, such as car pooling,[51,52] financial incentives,[53] and mass media efforts and publicity campaigns[49,54] result in population-level increases in active travel.

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- Programs such as Bike to Work Day introduce people to bike riding, and there is some evidence to suggest that they affect commuting habits, at least in some participants.[55]
- Ciclovía events—temporarily closing streets to motorized traffic and giving exclusive street access to pedestrians, cyclists, and other non-motorized modes of transportation—may have positive health outcomes, but more study is needed.[56]
- There are bikeshare programs in over 800 cities worldwide. The available data suggests that adopters of bikeshare are primarily those who also use public transit and those who walk.[57]

Policies that improve public transport, or make car use less attractive, increase the competitiveness of active travel modes.

- The much higher cost of car ownership and use in northern Europe compared to the U.S. encourages bicycling, especially combined with limited car parking, car-free zones, comprehensive traffic calming, and lower overall speed limits, which reduces the overall convenience and attractiveness of car use.[33]
- Promoting public transit can also be one strategy to encourage walking and cycling, as each trip via public transit typically begins and ends with walking or cycling. One review suggested that the extra physical activity associated with public transit was typically 12–15 minutes per person per day. In the U.S., 29 percent of those who use transit got 30 minutes or more of daily physical activity just from walking to and from public transit stops.[58]
- Giving employees cash instead of employer-paid parking can reduce levels of single-occupant cars, and increase rates of car pools, transit use, walking and biking.[54]
- Car-free city centers also reduce driving and increase walking and public transport use.[54]
- Lower speed limits for cars increase safety for cyclists and pedestrians, and also increase the relative speed of cycling when compared to motorized traffic.[33]

CONCLUSIONS AND POLICY IMPLICATIONS

Active travel, such as walking and cycling, can substantially increase levels of regular physical activity. The health benefits of physical activity have been well documented and apply to walking and bicycling for travel. Studies indicate that the health benefits of active travel exceed any associated risks of injury and exposure to air pollution. Designing policies and programs to increase walking and cycling is challenging, because individuals' decisions to walk or cycle are not only determined by their personal needs, preferences and attitudes, but also by a complicated mix of physical and social environments.[59–61]

Provision of convenient, safe, and connected walking and cycling infrastructure is at the core of promoting active travel. A key purpose of such infrastructure should be to protect pedestrians and bicyclists from cars, which is identified as a major barrier. Aside from specific infrastructure for cyclists and pedestrians, the way entire neighborhoods and communities are built affects levels of active travel, since community design determines whether trip origins and destinations are sufficiently close to each other to be covered by foot or bicycle. Policies that improve public transport can boost active travel as an access mode to transit, while policies that make car use less attractive will increase the competitiveness of active travel modes. Moreover, such efforts may be complemented through promotional programs that emphasize active travel as a convenient and healthy travel option.

There is clear indication that policies to promote active travel will work best when implemented in comprehensive packages; these may include infrastructure and facility improvements, pricing policies, and education programs to achieve substantial shifts towards active modes. Measures that promote public transit and policies that make car travel less convenient can also be included in a comprehensive package of policies and programs.[33,37,54,62]

Champions will be needed at all levels of government to embed active travel into transportation policy and guidelines. Traditionally, urban street and bikeway design standards in the U.S. have been focused on moving automobiles, and have often limited the implementation of innovative infrastructure for pedestrians and cyclists.[63] While some standards have started to change, more changes may be needed to promote walking and cycling. Studying innovative infrastructure measures (e.g., in pilot projects) may help achieve design standards that promote active travel.

While there remains considerable uncertainty about the precise effects of specific measures on levels of walking or cycling, the evidence is strong to support the conclusion that in general such efforts are warranted in light of the substantial health benefits to be gained from increasing active travel.

FUTURE RESEARCH NEEDS

A number of research needs remain in this area. Little is known about the specific effectiveness of any one factor in increasing walking or cycling, and for that matter, it remains unknown what the ideal mix of policies would be. Research can also help identify the specific policies or actions that can be taken by federal, state, regional and local agencies to increase active travel. As the evidence grows, there will also be a need to develop evidence-based tools that planners, engineers, advocates and politicians can use to make the case for active travel.

Improvements in data collection and evaluation methods, such as repeated (longitudinal) assessments applied to natural experiments and interventions, at sufficiently large scale, and with systematic consideration of a wide range of relevant factors are warranted. Such studies have only recently begun to emerge.[64] A recent review included seven studies of active transportation interventions (such as bike lanes, trails, or light rails) and found mostly positive results for physical activity outcomes.[65]

More generally, an improved understanding of the determinants of active travel behavior is required to improve and develop new, more effective measures to promote active travel. Of particular interest is the area of safety—both with regards to reducing crash risks, as well as understanding how people's perceptions of crash risks may discourage active travel. Cost-effectiveness studies would also be useful as a tool for policy-makers.

In the area of health impacts, one aim of research is to learn more about whether people substitute activity gained in transportation for other physical activities, by reducing their participation in sports or other forms of exercise.

Finally, in order for active travel to contribute to public health, it is crucial to understand how it can be promoted in subgroups of the population least likely to engage in physical activity.[28] This implies considering the equity distribution of policy, program, and infrastructure interventions to promote active travel.[50]

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